

Claims

1. A magnetron comprising: an anode having resonant cavities and coaxially arranged with a cathode about a longitudinal axis; output means including a coaxial line configured to receive energy in one oscillator mode and transmit it as a coaxial waveguide mode and to receive energy in another oscillator mode and transmit it as a cylindrical waveguide mode; and means for at least reducing onward transmission of energy in the cylindrical waveguide mode.
2. A magnetron as claimed in claim 1 wherein the coaxial line is arranged to receive energy coupled in an axial direction from the resonant cavities.
3. A magnetron as claimed in any preceding claim wherein the coaxial line has at least one axially extensive slot through its outer conductor via which energy in the cylindrical waveguide mode is coupled from the coaxial line.
4. A magnetron as claimed in claim 3 and including radiation absorbing material located at said at least one slot to absorb energy radiated by said slot.
5. A magnetron as claimed in claim 4 wherein the absorbing material is porous alumina impregnated with carbon.
6. A magnetron as claimed in any preceding claim wherein said one oscillator mode is the  $\pi$  mode and said another oscillator mode is the  $\pi - 1$  mode.
7. A magnetron as claimed in any preceding claim wherein the coaxial waveguide mode is

the TEM mode and the cylindrical waveguide mode is the  $TE_{11}$  mode.

8. A magnetron as claimed in any preceding claim and including at least one axially extensive reflector slit in the output means for reflecting energy from said another oscillator mode back towards the resonant cavities.
9. A magnetron as claimed in claim 8 wherein a reflector slit is located partially or wholly in a region between the resonant cavities and the end of the coaxial line nearest the anode.
10. A magnetron as claimed in claim 8 or 9 wherein a reflector slit is located in the surface of the outer conductor of the coaxial line.
11. A magnetron as claimed in claim 8, 9 or 10 wherein a reflector slit is located in the inner conductor of the coaxial line.
12. A magnetron as claimed in claim 11 wherein the reflector slit in the inner conductor is extensive therethrough.
13. A magnetron as claimed in claim 12 and including two reflector slits in the inner conductor which are extensive therethrough and intersect.
14. A magnetron as claimed in any preceding claim wherein the coaxial line is arranged to deliver energy to a waveguide.

15. A magnetron as claimed in claim 14 wherein the coaxial line terminates in a T-probe.
16. A magnetron as claimed in claim 14 or 15 wherein the coaxial line includes a discontinuity which at least reduces transmission along the coaxial line of energy reflected from the waveguide back towards the anode in a cylindrical waveguide mode.
17. A magnetron as claimed in any preceding claim and including a second coaxial line arranged to receive energy in said another oscillator mode coupled in an axial direction from the end of the anode where the cathode lead is located and transmit it as a cylindrical waveguide mode.
18. A magnetron as claimed in claim 17 and including at least one axially extensive slot via which energy is coupled from the second coaxial line.
19. A magnetron as claimed in claim 18 wherein the said at least one slot is located in the outer conductor of the second coaxial line.
20. A magnetron as claimed in claim 19 and including radiation absorbing material arranged to receive energy coupled from the second coaxial line via said at least one slot.
21. A magnetron as claimed in claim 20 wherein said absorbing material is porous alumina impregnated with carbon.
22. A magnetron as claimed in any one of claims 17 to 21 and including at least one axially

extensive reflector slit in the second coaxial line for reflecting energy from said another oscillator mode back towards the resonant cavities.

23. A magnetron as claimed in any preceding claim wherein the anode has an axial length of greater than  $3\lambda/4$ .

24. A magnetron as claimed in any preceding claim wherein the magnetron is an X-band linac magnetron.

25. A magnetron substantially as illustrated in and described with reference to any one of the accompanying drawings.